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ABSTRACT

An instructional television program was designed to instruct 80 special education teachers in how to select curriculum packages. The program was tested to see whether 90% of the learners attained 90% of the highest possible score on questions based upon program objectives. Further, the effectiveness of the program was compared with that of a printed article that contained comparable information. Results indicated that: (1) 90% of the participants who viewed the television program learned 72% of the content and 60% learned 90% of the content which is to say that the "90/90" goal was not attained; (2) participants who viewed the television program learned significantly more than those who did not; and (3) participants who not only viewed the television program but also read the printed article did not learn significantly more than the participants who only viewed the television program. (Author/SBH)

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APPLICATION OF THE 4-D INSTRUCTIONAL DEVELOPMENT MODEL:
DEVELOPMENT AND EVALUATION OF AN INSTRUCTIONAL
TELEVISION PROGRAM FOR SPECIAL EDUCATION PERSONNEL--
CHOOSE A CURRICULUM PACKAGE¹

Michael S. Parer

August, 1976

Final Report 51.4

Center for Innovation in Teaching the Handicapped
Indiana University

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Contents

List of Tables	iv
List of Figures	v
List of Appendices	vi
CHAPTERS	
I. STATEMENT OF THE PROBLEM	1
Summary of the Problem	
Instructional Development Models	
Non-broadcast Television	
II. REVIEW OF LITERATURE	5
The Systems Approach and the Creative	
Process in Instructional Development	
Instructional Development Models	
Instructional Development Television	
Models	
Concept of Mastery	
III. RESEARCH QUESTIONS	28
IV. PROCEDURE	30
Selection of Instructional Develop-	
ment Model and its application to the	
Design and Production of an	
Instructional Television program	
V. METHOD	44
VI. RESULTS OF EVALUATION OF RESEARCH QUESTIONS	52
VII. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	59
REFERENCES	62
APPENDICES	70

ABSTRACT

Many institutions have invested capital and many individuals have expended creative energies to use television for instruction. With some exceptions the results have not merited the money and energy spent. Some efforts have been made to develop instructional television programs based upon an instructional development model together with empirical data regarding learners' reactions to programs during the course of their production as well as after they have been completed. The present study is a continuation of this systematic-empirical approach to the production of an instructional television program. The program was designed to instruct special education teachers in how to select curriculum packages. The program was tested to see whether a "90/90" result was attained, i.e., whether 90% of the learners attained 90% of the highest possible score. Further, the effectiveness of the program was compared with that of a printed article that contained comparable information.

Eighty people working in special education participated. Four geographical locations were selected in a manner designed to approximate a representative sample of the special education teacher population. Subjects were randomly assigned in equal numbers to four treatment groups. Five questions based upon the objectives of the program were used to measure the recall of information.

The results indicated that (a) 90% of the participants who viewed the television program learned 72% of the content and 60% learned 90% of the content, which is to say that the "90/90" goal was not attained, (b) participants who viewed the television program learned significantly more than those who did not, and (c) participants who not only viewed the television program but also read the printed article did not learn significantly more than the participants who only viewed the television program.

It was concluded on the basis of the data, as well as on the basis of the writer's comparison of the program produced in the present context with programs that he has produced according to traditional procedures, that the systematic-empirical approach was very much the superior one.

In the present study the use of an instructional television program to present information to teachers about curriculum packages was more effective than the use of a printed article. This result may have been due to the fact that teachers spent more time viewing the television program than reading the article, and because the program was presented with musical background and visual examples of curriculum packages. All of this meant that the television presentation was more costly.

From this study it is concluded that a certain level of effectiveness was attained by the instructional television program. That conclusion was based on a test of recall of information about how to select curriculum packages. The implicit and underlying intent was that teachers would exhibit more effective selection and use of curriculum packages. Such selection and use were not observed in the present study.

List of Tables

	Page
1. Geographical Areas and Sample Population Numbers. . .	44
2. Procedure to Carry Out Experimental Design	49
3. Experimental Design to Test Instructional Module and Compare Individual Components	50
4. Location and Numbers in Each Treatment Group.	51
5. Level of Mastery Attained by Group B	52
6. Level of Mastery Attained by Each Group	53
7. Summary of One-way Analysis of Variance on Criterion Test	54
8. Tests on All Ordered Pairs of Means	55

List of Figures

	Page
1. The 4-D model	16
2. The Webster College television model	18
3. The Mississippi Authority model	19
4. The Project Strive model	21
5. The Far West Educational Development Laboratory model for research using television in human relationship studies	22
6. The Children's Television Workshop operational model	24

List of Appendices

	Page
A. Score Sheet for Use in Program Analyzer	70
B. Instructions to Subjects in this Study	72
C. Raw Scores of Subjects in Each Treatment	
Group at Each Location	74
D. Raw Scores of Subjects in Each Treatment	
Group in Rank Order	76

CHAPTER 1

STATEMENT OF THE PROBLEM

Summary of the Problem

Many institutions have invested capital and many individuals have expended creative energies to use television for instruction (McBride, 1976; Lee, 1971). With some exceptions the results have not merited the money and energy invested (Berkman, 1976).

Some efforts have been made to develop instructional television programs based upon an instructional development model using both inservice and postservice empirical data of learners' reactions to programs. The present study is a continuation of this systematic-empirical approach to the production of an instructional television program.

The present study investigated how the methods of instructional development using a systems approach can be used to define, design, and develop a television program for instruction (Carl, 1976; Thiagarajan, Semmel, & Semmel, 1974). This study was also concerned about the effectiveness of such a television program relative to that of a printed article.

An instructional television program that trained special education teachers to choose a curriculum package was developed, and then it was determined how effective the program was in relation to the objectives that had been established. Additionally, the effectiveness of the program was compared with that of a printed article that nominally contained the same information. The kind of learning required to choose a curriculum package is an example of what is sometimes referred

to as a pre-instructional competency; that is, a basic skill that a teacher performs prior to the presentation of curriculum material in a classroom.

Instructional Development Models

There are many models to guide the development of instructional materials. Some are designed to allow for the selection of the best medium after a clarification of the objectives (Briggs, 1967; Harries, 1972); and others are designed for a particular medium such as television because an institution has been equipped for that medium (Cavert, 1974). Most instructional development models, including the 4-D model (Thiagarajan, Semmel, & Semmel, 1974), contain the major elements of define, design, develop and disseminate. They are also based on the assumption that a superior result can be achieved through the use of a combination of (a) analysis of the target population's needs, (b) specification of behavioral objectives, (c) production of prototype materials, and (d) the application of a goal such as "90/90", i.e., 90% of the learners are to achieve 90% of the highest possible score on a posttest (Ofiesh, 1963, 1965).

To date, most instructional materials that train teachers of exceptional children have been produced in the slide-audio tape medium. Successful results have been achieved using the 4-D model with a series called "Tips for Teachers." This series was funded by the Bureau of Education for the Handicapped and developed by the Center for Innovation in Teaching the Handicapped (CITH), Bloomington, In. The instructional program developed in the present study was one in the "Tips for Teachers" series. It was the only one that was not produced in the slide-audio tape medium.

Non-Broadcast Television

The recent emergence of non-broadcast television (Robinson, 1974) as a successful instructional format in industry and medical training (Barwick & Kranz, 1975; Goff, 1975), combined with the wider availability of video equipment in educational institutions, has given rise to the question of whether television is an effective medium to use in training teachers of exceptional children (Marinoff, 1973; Weisborg, 1972). The widespread use of videotape recorders offers a new opportunity for instructional television to be used more extensively in education. As yet, educational leaders have not taken advantage of this opportunity (Bell, 1975). In fact, many television producers insist that television is a medium demanding a creative process which defies the "straight-jacketing" of design and analyses required by the systems approach (Lesser, 1974; Robinson, 1974; Schramm, 1972).

In spite of the fact that teachers as a whole regularly watch television, most of them say that they prefer to learn from print materials rather than television. This was determined during the initial design stage of the program produced in the present study. Research over several decades has shown that, when learners are exposed to instructional programs in a visual medium and in a printed article, a given amount of learning generally occurs in less time with a visual medium. Further, more learning occurs from the visual medium when a visual medium and print are used for equal time (Molstad, 1964, 1974; Schramm, 1974).

The first question the present study asks is whether an instructional television program produced according to an instructional development model achieves a "90/90" result. Following this a series of related questions ask whether the amount of learning resulting from the use of

instructional television alone is different from the amount of learning resulting from the use of a printed article alone; and whether the amount of learning resulting from the use of television and print together is different from that resulting from the use of television alone or from that resulting from the use of print alone.

CHAPTER 11

REVIEW OF LITERATURE

This chapter contains a selective review of the systems approach and the creative process as they relate to television. Educational technologists have applied the systems approach to instructional development models. Therefore, several models will be described, both those that have general applications and those that relate to television in particular. A description will be given of the stages through which a model was selected and used to design and produce a competency-based television module for training teachers in selecting a curriculum package.

The Systems Approach and the Creative Process in Instructional Development

With the use of the systems approach, instructional developers design instructional programs that ideally enable a high proportion of the target population to achieve mastery of the objectives (Briggs, 1970: Popham, 1970). This is done by a process of formative evaluation (Scriven, 1967) in which the prototype materials are revised until an acceptable mastery level is determined at summative evaluation. The literature relating to the topic of acceptable levels of mastery will also be reviewed in this chapter.

The systems Approach

The systems approach is the orderly application of empirical observation to the design and implementation of instructional tasks or entire programs. This process is known as systems design or the

systems approach to instructional development (Glaser, 1965). It implies the use of various analyses, the stating of behavioral objectives, the gathering of empirical data to evaluate the results of using the instructional material that is created, and "feedback loops" which allow the system to improve itself based on evaluation (Popham, 1970).

This approach offers a conceptual framework within which to plan and organize learning resources in order to achieve defined objectives. The techniques of analysis, synthesis and prototype production implicit in this concept are an attempt to answer the dual problem that has constantly beset educationalists--viz., what ought to be taught, and is the learner actually learning (Davies, 1975; Heinich, 1968).

Two facets of the systems approach are its methodological implications and its range of application with respect to educational problems. Each of these will now be discussed in turn.

The Systems Approach as a Methodology

As a methodology, the systems approach to instruction reflects the application of behavioral principles to the design of instructional programs that are replicable both in terms of stimuli and the effects of learner interaction with those stimuli. The relationships between components of the system and the learner must be specified, monitored, and controlled in order to achieve the stated goals (Gagné & Briggs, 1974; Lumsdaine, 1964).

The sequential steps of this methodology are as follows: A needs assessment to determine whether there is a problem, a target population analysis and task analysis to determine the precise nature of the problem; the development of instructional objectives; selection of instructional strategies; sequencing of instructional events; selection of media;

developing or locating the necessary resource materials; evaluation of the effectiveness of the resources; revision of resource materials until they are effective; implementation of an effective diffusion and adoption strategy to ensure that the materials are adequately used to meet the original problem (Komoski, 1972).

There is a danger in viewing the systems approach as an automatic, step-by-step process (Beard, 1972). It may not be the case that for every decision point many individuals and professional disciplines must be integrated and welded together in a step-by-step process (Agency for Instructional Television, 1975). It has been suggested that the failure of instructional technology to produce widespread changes in education has not resulted from the instructional development process, but rather from the threat that instructional developers have posed to teachers and content experts (Braham, 1973). Teachers feel manipulated when they are asked to organize their planning within a new structure (Thiagarajan, 1973; Mitchell, 1971). And while most teachers and content experts acknowledge the value of field testing, few are prepared for the systematic criticism of their ideas and familiar phrases (Markle, 1967). The success of the systems approach in education requires a continual clarification of the tasks and responsibilities as well as a competent leader to manage all human resources (Davies, 1973; Silber, 1970). This human management problem is not confined to the use of television for education, for it occurs in the case of other complex technologies such as the computer (Oettinger, 1970). However, the implications are made explicit in the case of television in a report by the Carnegie Commission on Higher Education which predicts that it will not be until 2010 that television can expect any widespread

classroom use (Carnegie Commission on Higher Education, 1972). Nevertheless, the systems approach does offer a methodology to improve the quality of instructional materials. The full utilization of this methodology requires attention to organizational management with respect to all individuals involved in the development and production process.

The Systems Approach as a Level of Operation

The systems approach may be applied to various levels of operation. These applications range from educational administration of finances and staffing to the analysis of entire training courses. An example of this level of operation is the systems approach as it is used to coordinate the diverse elements at the British Open University (Kitzes & Knox, 1972). There, the different parts of the university system are subtly interconnected and, because the students are spread throughout the country, the activities and decisions in one part can have a ripple effect and/or unforeseen consequences. While this is true in all universities, the problem is magnified by the widespread use of television in the British Open University. As a consequence, the substance of various activities has to be thought through with care (Lewis, 1971). The open University experience highlights a major problem that results from the application of the systems approach to television (Dorn, 1974). The planning of curriculum for television and the production of television programs cannot be a simple, single, linear time pattern, as many instructional television enterprise is a complex interlocking network. Linear hierarchical structures cannot accommodate the subtleties of television, which include interrelationships that accumulate about a variety of people with

diverse professional responsibilities (Lesser, 1972). These relationships begin with the political decision to invest large resources in instructional television, and they continue through the designers of the courses to the script writers, the complex production crew, the instructors using the television programs and the learner viewing on a mass medium apart from a visible classroom teacher (Williams & Van Wart, 1974).

The application of the systems approach to instructional television has not been easy (Warren, 1974). Cases of jettisoned television projects and institutions with television studios standing like abandoned graveyards are not uncommon (Hood & Johnson, 1969). Part of the problem is the complex nature of television production as noted above. Another reason is the enormous cost involved in the medium, combined with the consequent adverse feelings of many teachers (Gordon, 1970) and educational administrators who believe that the money could be better spent (Cook, 1966). Teachers and educational administrators call for cost-effective accountability that is not demanded of the more traditional education expenditures. The gathering of summative evaluation to provide data for television accountability is time consuming, costly and difficult to obtain (Ball & Bogatz, 1970). A further reason for the lack of a more widespread application of the systems approach to instructional television is the chasm that has existed between the television producer and the instructional developer (Babin, 1970; Finn, 1965). The television professional rarely has knowledge about the theoretical basis of the systems approach. As a result, it is difficult for many television producers to tolerate, much less welcome, the constraints of researchers and evaluators who, while field testing (Komoski, 1974), make fine-grain criticism of

the program and then offer data that require that some of the program -- all too often the finest sequences--be revised and supported by print materials (Palmer, 1972).

Thus, the systems approach offers an aid to harnessing the resources of Television for instruction, but it is not a simple or magical panacea (Merrill, 1971). The use of television is further complicated by the assumption that successful television requires a unique ingredient, sometimes called a creative process. We shall now consider this complication.

The Creative Process

In the theater the producer has the final say on stage; likewise, the television producer is accustomed to the final say on the television set. Further, the television producer identifies with the age-old belief in the theater that the creative insights of the producer are ultimately the most important ingredients of successful productions. The technology of a systems approach seems foreign and jars the television professional's instincts. The concept of creativity underlies this tension between the television professional and the instructional developer as both vie to harness the television medium for instruction via their varying routes of the creative process and the systems approach (Wiman & Meierhenry, 1968).

A solution to this dilemma seemed imminent in the Children's Television Workshop (CTW) where it was the task of the executive director to weld all personnel, professional disciplines and technological resources in the task of design and production. However, there is disagreement as to whether the CTW was so successful in producing Sesame Street because of the use of the systems approach, or whether it was because of a unique executive director who united the diverse talents of television profes-

sionals and people who subscribed to academic curriculum, research and evaluation traditions (Lesser, 1974; Thiagarajan, 1971).

The creative process is not easy to identify (Ghiselin, 1952; Bruner, 1961). Creativity often works in a sea of indecision. Chaos and disorder are perhaps the wrong terms for what results in an organic and dynamic process, but creativity typically begins with a vague idea, a confused excitement, or a sort of yearning, hunch, or other preverbal intimation of approaching potential resolutions (Spencer, 1904; Whitehead, 1925).

The creative person in education, be it with instructional television or in the classroom, usually encounters considerable difficulty because every creative act threatens to supplement the established order in some degree. Thus, the innovator is likely to appear eccentric. The innovator ordinarily must begin to gather a group and slowly create a product or an organization that can accept some unique creative contributions (Darwin, 1846).

While most people acknowledge that the creative artist is valuable in the production of instructional media, such a person is often extremely difficult to work with. Those who stress the creative urge may be extremely vague and hardly able to identify it beyond a commerce with disorder (Scherijon & De Gruyter, 1937). The creative order is an extension of life; it is not an elaboration of the established, but a movement beyond the established, or at least a reorganization of the established with elements added that were not previously included (Barlow, 1967). It is a transcendence of the old order, a coming from outside our world yielding to certain ill-defined impulses that lead to a surging chaos of the unexpected (Lowes, 1927).

This creative process can divert a person from formal achievement. There is also a spontaneous and involuntary element in the process, as seen in poets such as Shelley and Blake. Creativity as an automatic invention is claimed by a number of intellectual writers (Spencer, 1904; Nietzsche, 1927). However, there is equal testimony that the creative process is a product of extraordinary preparation and systematic work.

Much of creative inspiration is produced by conscious labor and by what Mansfield (1928) has called "terrific hard gardening". However, this procedure does not always yield success. Many problems may remain unresolved and insights underdeveloped no matter how much effort is applied. That unsearchable insight, often called inspiration, is sometimes apparently given at one whole stroke. Nevertheless, it is usually preceded by an enormous amount of "gardening". There is much lore about the creative process that overlooks the systematic approach and ignores the effort that necessarily goes into a final work. Understanding, discipline and hard work are essential to the creative process (Mansfield, 1928). Many creative writers, artists and producers have their own methodologies and are unaware that they operate by them (Getzels & Jackson, 1962). Finished productions have a simplicity of order, and it is easy for an artist reporting the processes to inadvertently conceal the amount of conscious planning involved in the production, or be unaware of a model that was used to bring some order into the creative process (Bruner, Goodnow, & Austin, 1956). Easily forgotten is the rejection, the trial and error of so many words and ideas that they put to the test of their own experience. Also overlooked can be the frequent testing of a painting or a play on visitors, professional experts and

small target populations. Likewise, in the writing of educational books, it is easy to overlook the amount of testing on a class that a professor may give his material year after year, before it is finally published. This unconscious process may be at work with many individuals who have an intuitive, creative and systematic method (Taylor, 1964). Yet a project director cannot be content to sit by and wait for a William Shakespeare to appear. The demand for instructional media continues to increase, and to develop them, other successful projects are studied so as to glean their helpful methods. This is a function of the instructional technologist who seeks to evolve a new discipline by analyzing successful methods and procedures. The currently acceptable means of presenting and describing these processes is with instructional development models, and the phrase associated with the method is the systems approach (Guilford, 1958).

A danger of overdependence on a systems approach is that it is easy to exclude the contribution of some work which may prove to be a valuable educational innovation. A parallel may be drawn to a novelist who has to abandon attempts to plan a book without method or theory because a formal plan is unsuitable (Wolfe, 1936). This should not be considered as evidence that planning is detrimental, but it does indicate that plans must be flexible. Those experienced in television production would quote many examples of intuitive and spontaneous change from the script at the moment of production (Hendricks, Guilford & Hoepfner, 1969).

A systems approach may never be a complete substitute for the creative process in instructional television, yet the methodological strategy of a suitable instructional development model offers a means to free the creative mind of many preoccupations about such things as the precise

target audience, the nature of the instructional problem, various media possibilities and possible diffusion and adoption strategies (Gruber, Terrell & Wertheimer, 1962). Such a model can be a liberating device that can give the creative person greater freedom to operate (Poincare, 1946).

There is no evidence to date that successful instructional television can be generated by the creative process, but there are examples of how television is greatly enhanced by creative professionals using a suitable instructional development model and the systems approach (Cavert, 1974).

Instructional Development Models

It is difficult to confine the creative process to the square boxes of instructional development (ID) models; nevertheless, they can help to harness creative energies (Knapp, 1968). With this end in mind, instructional models that are used to design instructional materials and instructional television will be reviewed. We make the following two assumptions: (a) a systems approach of instructional development is helpful to effective ITV production, and (b) the systems approach is aided by the use of instructional development models.

In the literature of educational technology, there is no lack of ID models for the development of instructional material (Banathy, 1968; Hamreus, 1968; Kaufman, 1972; Tracey, Flynn & Legere, 1967; Wong & Raulerson, 1974). These models all have a systems approach that requires objectives, analysis, criterion tests, prototype production and formative and summative evaluation. Some models direct effort to a selection of the optimum medium based on the target population and on content and context

analysis (Thiagarajan, Semmel & Semmel, 1974). Others give specific procedural guidelines for a particular medium (Cavert, 1974).

During the past decade the volume of instructional materials using non-print media has more than doubled (Komoski, 1974). This increase has led many educational technologists to recommend the development of instructional materials using definite media such as audiotape (Postlethwait, 1971; Russell, 1974), slides and filmstrips (Kemp, 1968), films (Spottiswood, 1957), television (Littell, 1973; Mattingly & Smith, 1973) and computer-assisted instruction (Semmel, Olson & Weiske, 1972). Many cases can be cited to show the effectiveness of each of these media in instructional situations (Moldstad, 1974).

A comparison of 12 instructional development models (Stolovitch, 1975) yielded a number of comparisons and contrasts. Twelve models were chosen and studied as representative of all generalized instructional development models. They are as follows:

- (1) Briggs' Design of Instruction Model (Briggs, 1967), developed with a prime concern for the actual design of instruction, and one of the most carefully elaborated and detailed models.
- (2) 4-D Model (Thiagarajan, Semmel & Semmel, 1974), conceptualized on the basis of needs of teachers of exceptional children for self-instructional pre service and inservice mediated instructional materials. This model (define, design, develop, disseminate) was prepared as a means to yield effective instructional materials for teachers in special education. It is a format-free model that can be used with any single medium or combination of media: audio, visual, print, or computer (Figure 1). This model was used in the preparation of all modules in the "Tips for Teachers" series.

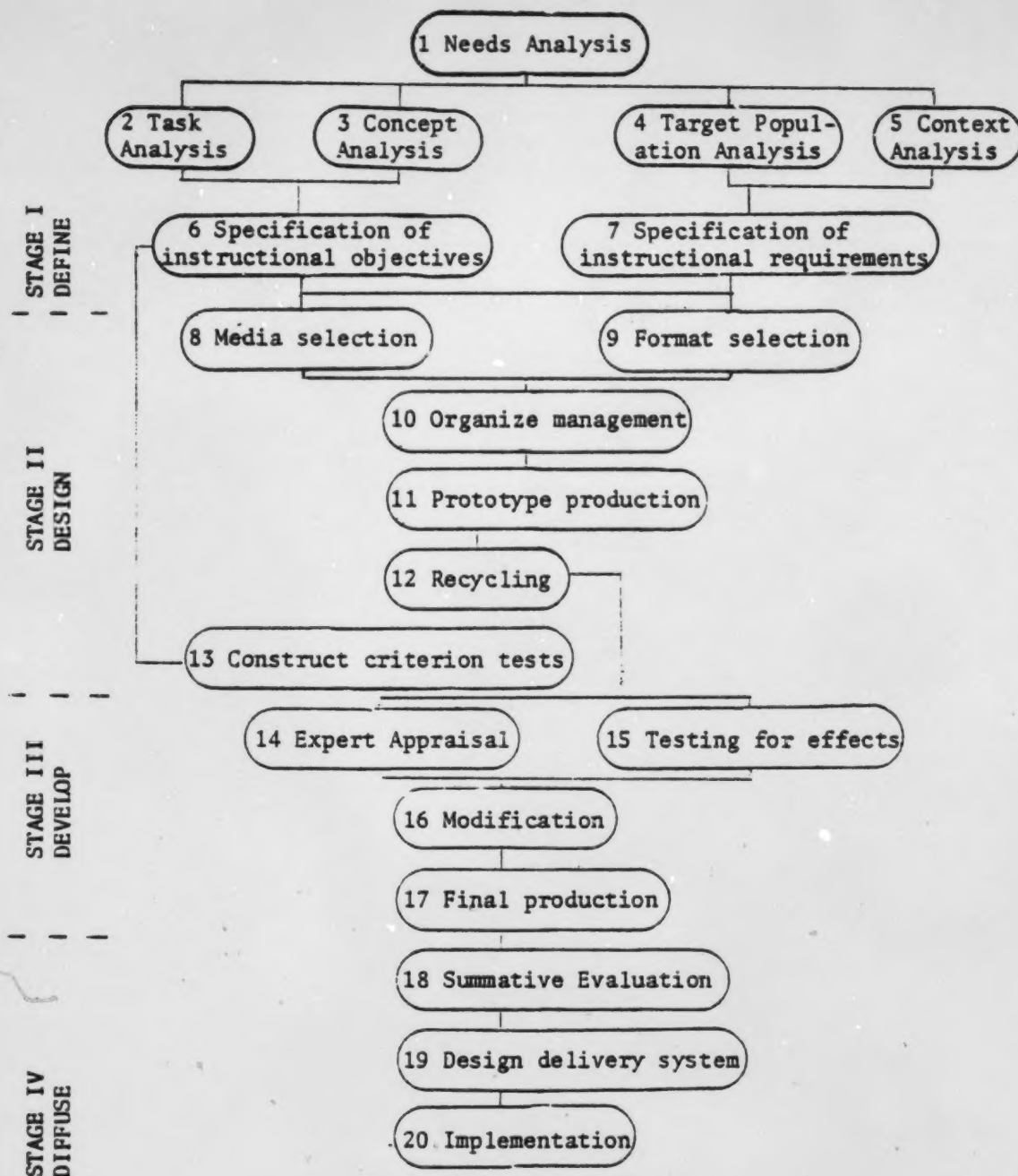


Figure 1. The 4-D model.

- (3) Instructional Development Institute Model, revised and compressed Hamreus' Teaching Research System (Hamreus, 1968) into a nine-step instructional development model.
- (4) Kaufman Model (Kaufman, 1972), a model which seeks solutions to educational problems and instructional development through a management-oriented process.
- (5) Wong/Raulerson Systems Model of Instruction (Wong & Raulerson, 1974), aimed towards classroom users "to bring together some of the principles, theories, and applications from relevant fields. . . and to organize them into a brief understandable package that will help teachers and instructional designers."
- (6) Great Plains National Model/Process for Instructional Design (Cavert, 1974), starts from a media base of instructional television and attempts to apply a systems approach to the design and development of instruction.
- (7) Faris-Stowe Instructional Development Model (Faris, 1968), designed to provide instructors at the university level with a systematic and logical sequence of steps for the development of units of instruction.
- (8) Banathy Instructional Development System Model (Banathy, 1968), focuses on making decisions about what is to be learned, how, by whom, and under what conditions.
- (9) Project MINERVA Instructional Systems Design (Tracey, Flynn, & Legere, 1967), designed by the U.S. Army Security Agency Training Center as a management strategy and to renovate their training program.
- (10) Systems Approach for Education (SAFE), designed as a problem-solving device for educators.

- (11) Michigan State University Instructional Systems Development (Barson, 1965, 1967), developed for college faculty to use in designing courses.
- (12) Teaching Research System (Hamreus, 1968), developed for use by professional instructional technologists and developers of instructional materials.

Instructional Development Television Models

There is much literature and decision-oriented research on instructional development in ITV (Bretz, et al., 1971; Cavert, 1974). Yet even when ITV projects set out to follow the systems approach, the methodology is seldom adhered to because of pragmatic constraints. Practitioners stress that no model can work if its human components do not cooperate and make it work (Carl, 1976), and experience has shown that models used in television are subject to constant violation and revision. The only viable approach is to formulate a trial model, and to solicit the maximum and ongoing participation by those who have to work with it (Low, 1973).

There are many instructional development models used in ITV that are so general in their outline or that are geared to such a specific program area that their value is extremely limited to a project director of a new TV program.

One of the most basic models was used at Webster College (Figure 2) in a project to produce commercials that instruct and entertain (Herd, 1973).

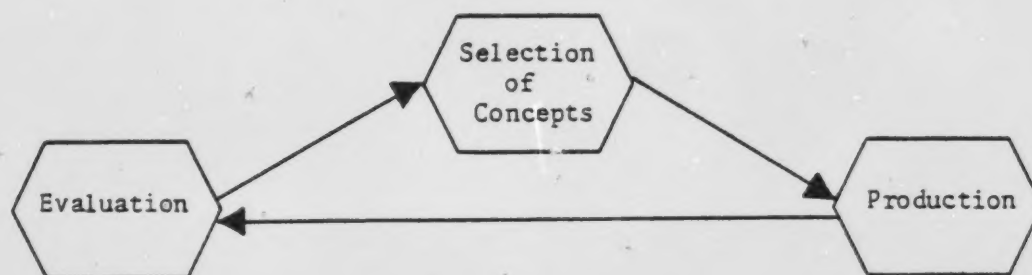


Figure 2. The Webster College model.

At the Mississippi Authority for ETV (Welliver, 1972) a systematic approach was used to develop television curricula (Figure 3). The model was a six-phase self-renewing cycle in the production process. In the description accompanying the model a detailed breakdown of each state indicates frequent opportunities for evaluation.

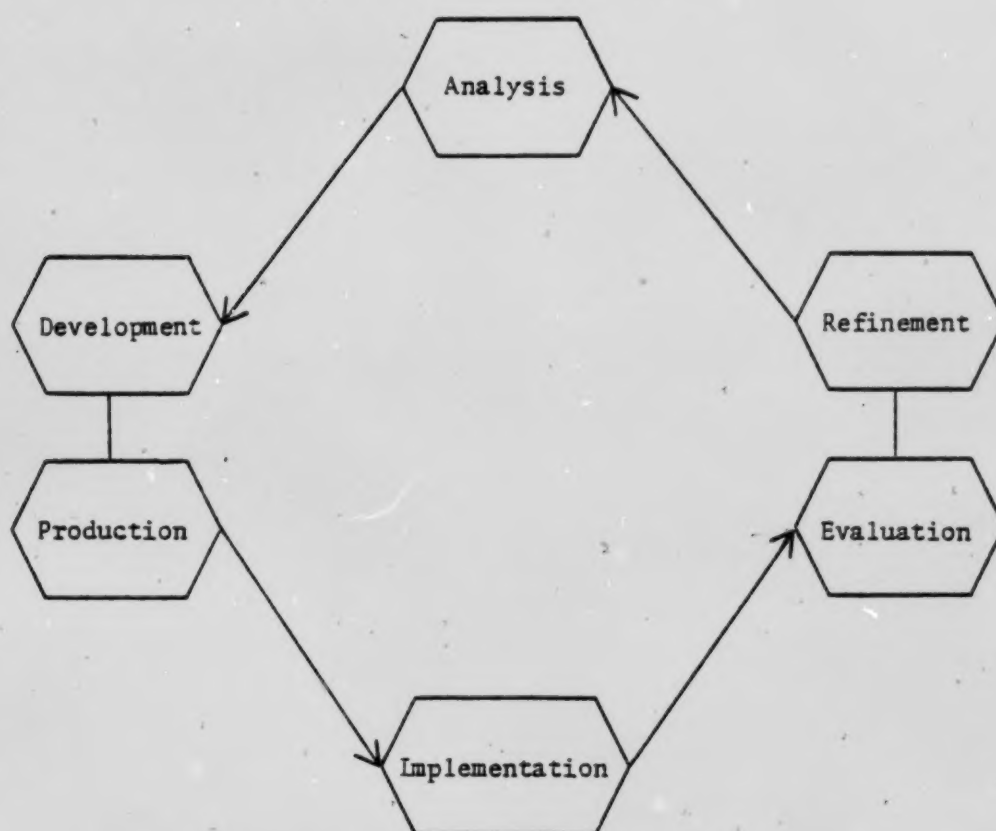


Figure 3. The Mississippi Authority model.

2c The Adult Learning Program Service (ALPS) designed a model to work out procedures used in preparing programs for Television (Project STRIVE, 1972). It employs the basic and classic instructional development theory of the cybernetic feedback loop (see Figure 4).

Far West Education Development Laboratory for Research and Development outlined a model for the development and evaluation of a television workshop in human relations (Hood & Johnson, 1969). This series was designed to ease racial tensions in elementary schools between white and black pupils, families and teachers (see Figure 5).

All of the above projects are peripheral to the mainstream of instructional television, and the models they have devised are rather simplistic. While they incorporate elements of the systems approach, they cannot be said to ideally embody all of the critical elements. Nevertheless, they all include two important decisions--firstly, that production is not to be based solely on creative intuition; and secondly, that evaluation be included from the outset to justify and test the program content and style (Mielke, 1975). Thus, these projects reacted to the widely held assumptions that creative intuition was the best method to develop ITV programs, and that well produced instructional programs are effective instructional products (Herzberg, 1966).

Perhaps the three most significant ITV agencies using instructional development theory are the Children's Television Workshop, the Agency for Instructional Television (AIT) and the Great Plains National Instructional Television Library (including the State University of Nebraska and the University of Mid America Television projects).

Within these agencies certain assumptions were made that incorporated the role of the instructional developer from the outset. These decisions

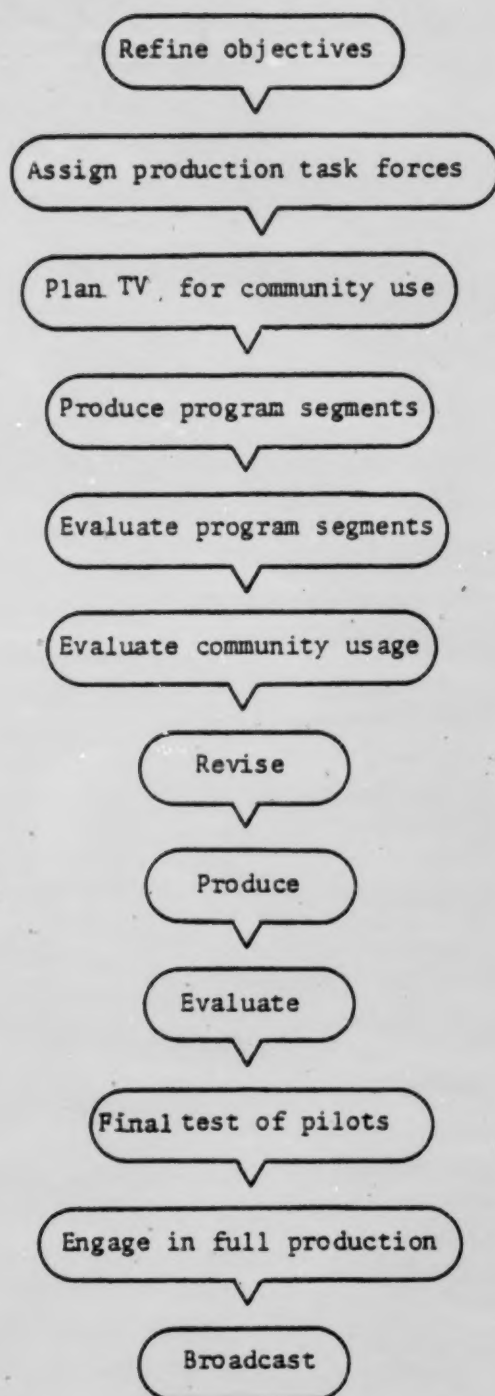


Figure 4. The Project Strive model.

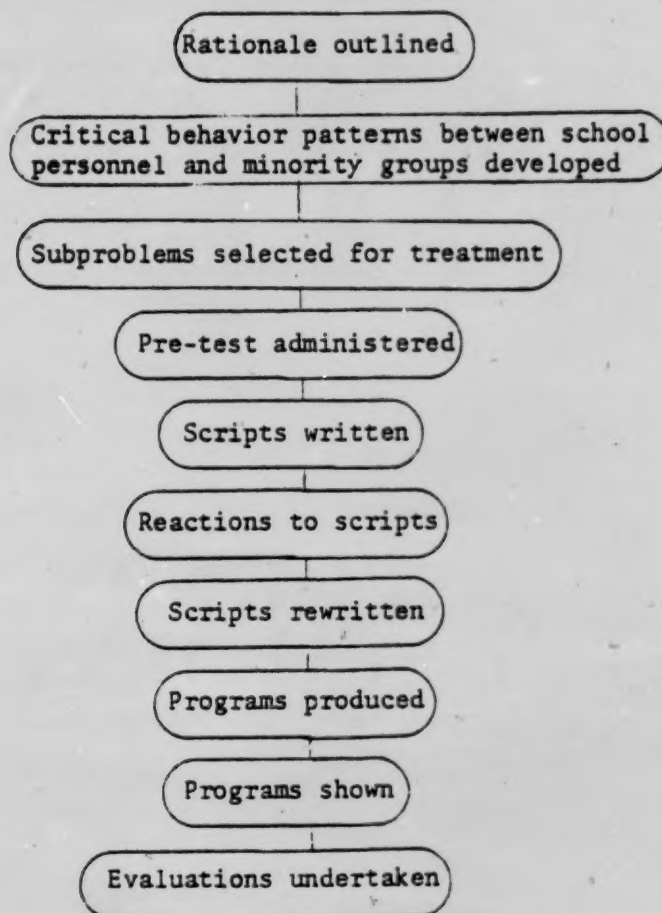


Figure 5. The Far West Education Development Laboratory model for research using television in human relationship studies..

included the following: curriculum planning must precede production; a focus on the target population is critical to ensure program effectiveness; systematically gleaned factual data must be fed into the creative and production processes; and the final program must have verifiable evidence of success on a sample of the target population (Palmer, 1972).

This approach has been embodied in the activities of the Children's Television Workshop. The origin of the researcher-producer marriage is told in the production story behind Sesame Street:

She (Ms. Cooney) knew that some rational system for generating goals had to be found, and that she wanted to include people who knew children from diverse points of view. As we began puzzling over how a system could be created, it was clear that professionals would be asked to provide more than window-dressing. We also talked about the role of research in the project, including how observations of children should not only be made to evaluate the impact of the series after it had been broadcast but also to feed the producers and writers with ideas about how to improve the show from day to day (Lesser, 1974, p.5).

This most successful paradigm for ITV was the insight at the foundation of the Children's Television Workshop, namely, that research and production should join forces together to develop a TV series. This obvious truth was always acknowledged by instructional developers, but was not clear to the television professional. The problems that remain in many instructional television projects indicate that instructional developers and television producers rarely make happy bedfellows.

The Children's Television Workshop (CTW) project evolved a working model (Bretz, 1971) (Figure 6) which proved extremely successful for Sesame Street and The Electric Company, but failed to produce similar results for the adult health program Feeling Good. This has led to a query that perhaps the success of CTW is due to factors other than the researcher-producer model for cooperation. For example, it may be due to a unique

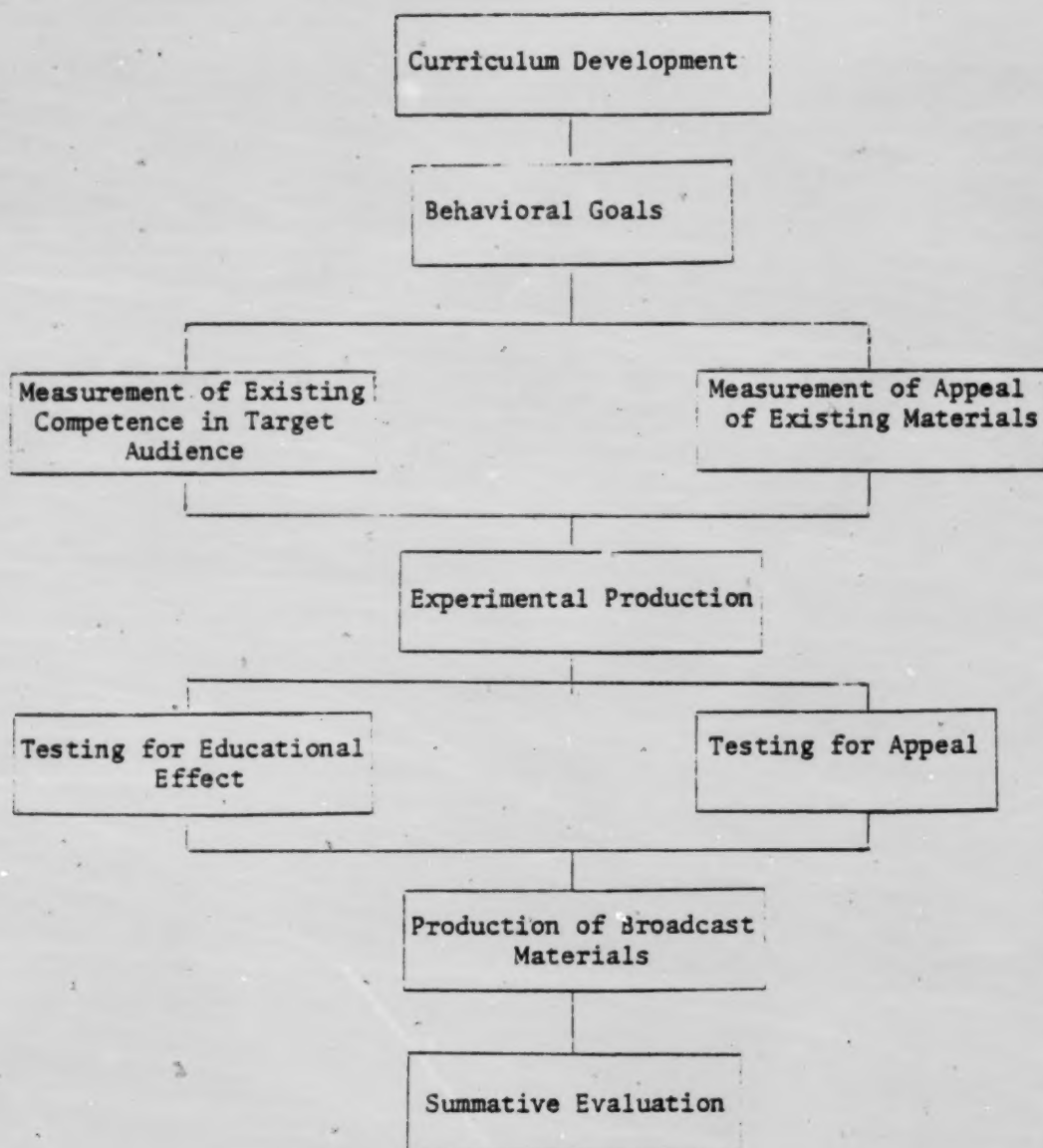


Figure 6. The Children's Television Workshop operational model

executive producer or administrator who was capable of welding a research and production team into a cooperative combination.

The most extensive work on an instructional development model within instructional television has been at the Great Plains National Instructional Television Library (Cavert, 1974). This model has received sanction from the Association for Educational Communications and Technology and is based on the procedures developed for Project ASERT (Available Supplemental Educational Resources by Television). It identifies eight major categories of concern: frame of reference, target population, needs, goals, strategies, structure, mediation, and diagnosis. The model aims to add the systems approach to the process of television development and production and so gives reliable procedures to ensure that decisions are based on data which is precise and pertaining to the goals and objectives. Yet, the explanation that accompanies this model is so detailed and prescriptive that for many it only confirms the difficulty of developing programs with the aid of little boxes. Robert C. Geralditi, in a perface to the presentation by Cavert's work, defends the model and argues that many creative works are accomplished when based on well defined structures, and that this model can be an aid to the creative process in television design and production. Further, in support of this model it is said that the procedures have been validated and have grown out of the working reality within an actual TV operational setting. Materials developed with this model have been tested, and the confident claim is made that, by using these procedures to approach instructional design, it is possible to achieve the confidence necessary for valication, without the uncertainty of relying on intuition or the complexity of going through the schematic convolutions of a pure system analysis (Cavert, 1974).

The Agency for Instructional Television (AIT) model has three parts: initiation, content development, and production stages. Within each is the opportunity for formative assessment and recycling (Flaughner, 1974). Although summative evaluation is built into the model, it has been neglected to date because of fiscal restraints. A critical and unusual component of this model is the integration of a nationwide consortium. AIT has been successful in implementing a rigorous systems approach and has remained apart from the actual production process. By maintaining the Executive Producer role it has been able to integrate the curriculum specialist and the television producer with a remarkable degree of harmony and success.

The justification of using the systems approach in program development is to produce an instructional product that achieves a high level of mastery in the target audience. We shall now discuss the topic of mastery briefly.

Concept of Mastery

How much should an instructional media program be expected to teach, inform, or influence? (Sedlik, 1971). To be effective it would need to produce results in the learner somewhere from a simple increase in understanding to a complete learning of everything in the program (May & Lumsdaine, 1958). The optimum would be where each learner scores 0% on the pretest and 100% on the posttest. In this way nothing would be taught that is already known (Zaccarie & Olsen, 1964).

In the 1960's, the Air Force Air Training Command developed the program used in Air Force training courses with the 90/90 criterion (Ofiesh, 1963). In this program 90% of all students had to score 90% or more on a comprehensive posttest covering all of the objectives before the course would be released for widespread use. The

assumption underlying this criterion was that the responsibility for learning was placed on the program and the instructional technology used. If the student failed to learn, then it was presumed that something was wrong with the program. It was to be revised until it was so good that it taught virtually everybody. However, effectiveness costs money, and a standard of 90/90 may be possible only in the armed forces. The traditionally accepted classroom standard is 90/50, i.e., where most learners achieve a pass. With an investment in media technology and a degree of formative evaluation, a 90/70 criterion is reasonable to expect. But to go from 90/70 to 90/90 normally will require a number of revision and test cycles. In terms of human and technological resources it is estimated that it takes four to six times as much effort to go from 90/70 to 90/90 as it does to go from 90/50 to 90/70. This increased cost easily prices the product out of reach of the average school administrator who is hard pressed for money in his budget.

There is a tension in the design and development of instructional television programs due to television professionals' identification with traditions that hold the creative process to be the most significant element in production. Instructional developers endeavor to resolve this tension in instructional television by using the systems approach which is operationalized through the systems model. In the present study an instructional television program was designed and produced on the basis of the 4-D model and its effectiveness determined in terms of level of mastery.

CHAPTER III

RESEARCH QUESTIONS

The present study was concerned with the design, production and evaluation of an instructional program that was developed using the systems approach and more specifically the 4-D model. The program sought to train teachers in a preinstructional competency (using a television and a print component). Such programs, using the medium of slide-audio tape and developed according to the 4-D model, have been shown to be effective (Stolovitch, 1975). The present study can perhaps be best characterized as a case study. The study embodied a number of questions, the first of which concerned mastery level. It was as follows:

Research Question 1: Does an instructional module produced according to the 4-D Model with a video and print component to train special education teachers to choose a curriculum package, achieve a 90/90 result?

One of the objectives of the present study was to produce an instructional program based on an instructional development model. That process required a needs analysis and target population survey. The target population survey indicated a preference of teachers to learn the subject matter from a printed article.

Research shows that instructional media programs generally produce greater scores when compared to traditional teaching methods for equal time periods. Research also shows that instructional media programs produce scores equal to those resulting from traditional teaching methods that typically occupy greater time periods (Moldstad, 1974).

A series of related questions compared the scores of the group that viewed the television program only, the group that read the printed article

only, the group that viewed the television program and read the printed article, and the group that neither viewed the television program nor read the printed article. Thus, a complete comparison between all groups involved the following questions:

Related Question 1. What is the difference in the scores on a recall of information test between a group that gets no component of the module and a group that receives both the video and print components?

Related Question 2. What is the difference in the scores on a recall of information test between a group that receives no component of the module and a group that receives the video component only?

Related Question 3. What is the difference in the scores on a recall of information test between a group that gets no component of the module and a group that receives the print component only?

Related Question 4. What is the difference in the scores on a recall of information test between a group that receives the video and print component and a group that receives the video component only?

Related Question 5. What is the difference in the scores on a recall of information test between a group that receives the video and print components and a group that receives the print component only?

Related Question 6. What is the difference in the scores on a recall of information test between a group that receives the video component only and a group that receives the print component only?

CHAPTER IV

PROCEDURE

Selection of an Instructional Development Model and its Application to the Design and Production of an Instructional Television program

As already noted, this is a study about the design, development, production and evaluation of an instructional program. It is a study in two parts. The first part is to select and apply an instructional development model to define, design, develop and produce an instructional television program. The second part is to evaluate the effectiveness of the instructional television program developed on that model.

This chapter will describe the choice of an instructional development model, and it will describe the application of that model to the process of producing the instructional program.

An analysis of the various instructional development models outlined in Chapter III shows that all have some common and essential features. In the process of selecting one for use in this study, four models commanded consideration.

The Children's Television Workshop (CTW) model has yielded the most spectacular success of any instructional television program. Nevertheless, that project has features quite different from the "Tips for Teachers" series. The CTW had to develop a new curriculum strategy aimed at pre-school children; their programs had to compete with commercial networks in prime-time viewing periods, and they began with a budget of \$8 million for the first year. The Agency for Instructional Television also has a record of outstanding success. However, a critical feature of the agency's

work is the integration of various Departments of Education from many states into a single consortium. In addition, their programs are part of a total learning experience in which the role of the television program is to establish a suitable classroom environment for a teacher-led discussion. This is quite different from the purpose of the "Tips for Teachers" series. Cavert's Great Plains National Instructional Television Library model is impressive, not because of any notable television successes produced from it, but because of its highly prescriptive nature, which in turn poses difficulties in using it on other projects.

An examination and comparison of the 12 general instructional development models mentioned above (Stolovich, 1975) and the three television instructional development models (Carl, 1976) showed the 4-D model to be comprehensive and to contain all of the essential elements of other models; it is format-free and so could be used for instructional television, it was designed to develop media programs to train teachers of exceptional children, and it had been used in previous productions of the "Tips for Teachers" series.

Therefore, the 4-D model was selected as the basis to design the present program. This was to be the first time that it would be used for a television production.

Needs Analysis

A systematic analysis of the actual needs to be met by a project should precede the decision to invest in instructional television. The general concern of policy makers for a problem area ought to be followed by data collection, identification of the precise problem, ordering of priorities, a study of available resources, and consideration of potential solutions. Only then can a decision be made about the most suitable

means of solving the problem and whether television can make an appropriate contribution. Once a decision has been made to invest in television production, the project director should conduct a field analysis in order to gather data to rank order instructional priorities and to specify instructional requirements. This is the first stage of the "4-D" model--namely, to define the instructional problem. This is done by what is called a needs analysis. This is subdivided into four categories: target population, context, task and concept analyses. In this study the task and concept analyses were combined into one and thus, the needs analysis comprised three separate analyses.

Target Population Analysis. Instructional television programs that are developed without a careful regard to the characteristic of the intended audience are usually ineffective (Gordon, 1970). The target population analysis seeks to establish the learners' entry level knowledge, skills and experience.

In the present project, the target population analysis was designed in two parts. The first was to be administered to special education teacher trainees and the second to special education teachers within interview situations that were to be recorded on audiotape. In the first, trainees were asked the following questions to elicit data about their information and skills in selecting and using curriculum packages:

1. What is your attitude to the curriculum packages developed under BEH funding since 1968? Have they solved the curriculum needs in special education?
2. Are you aware that there are curriculum packages now available which have been developed to meet a teacher's needs with exceptional children?

3. Did you get sufficient information in pre service training to select the best curriculum packages to meet your needs?

4. Why are teachers not using these curriculum packages that have been developed for their classroom needs?

5. What are the barriers to teachers obtaining curriculum packages that they have selected as being appropriate for their needs?

From the survey the following points emerged:

1. Curriculum packages are not a complete solution, but are a significant contribution to the curriculum problems for exceptional children.

2. There is much confusion about the volume and value of the curriculum materials on the market.

3. Teachers need basic information about the elements of good curriculum packages.

4. Direction is needed about where to get authoritative information about curriculum materials.

5. Teachers need a taxonomy to help in their selection of curriculum materials for their exceptional children.

In the second part of the target population analysis, special education teachers were asked questions in an audiotaped interview situation in order to discover their attitudes toward the knowledge and use of curriculum packages.

The questions were:

1. What were you told of curriculum packages in inservice training?
2. Where do you obtain information about curriculum materials?
3. Does your school have curriculum materials available?
4. Do you have a say in what curriculum packages are purchased?
5. How many curriculum packages have you used? Please tell of your

positive and negative reactions to them.

6. If an instructional program were to be developed on curriculum packages, what would be the most important things to cover?

From that analysis the following conclusions emerged:

1. Teachers felt commercial publishers had a vested interest in curriculum materials, and that they were far more concerned with profits and glossy packaging than with quality instructional materials.

2. Teachers were unaware of the investment of BEH in curriculum packages.

3. Teachers were highly skeptical of claims that materials had been validated and field tested.

4. Information about curriculum packages was gained in a most haphazard manner from conventions, advertisements and salesmen. None knew of the Area Learning Resource Center Network set up by BEH as a computer information service.

5. Teachers wanted objective and reliable information about the essential features of good curriculum packages and where to seek detailed information on particular subject areas.

6. Teachers wanted a sample check list to help them select curriculum packages for their needs.

Context Analysis. This analysis concerns both the context that gave rise to the development of the present instructional program and also the situations in which it will be used. In the present study the context analysis was conducted by videotape and the content of five workshops given by major curriculum developers was analyzed. These workshops were given by Dr. Herbert Goldstein, Social Learning Curriculum, Yeshiva University, New York, N.Y., Dr. John Cawley, Project Math, University of Connecticut, Storrs, Conn., Dr. James Lent, Project More, a curriculum on basic skills, University of Kansas, Lawrence, Kansas; Dr. J. Bourke, Reading and Roy Gromme, "Me Now" on biology, Biological Sciences Curriculum Study, Boulder, Colo.

From these workshops it emerged that, after 1945, schools gradually began adding projectors, large libraries, and resource centers. Publishers branched out from books to filmstrips, building blocks, and records, and added new departments to keep pace with developing technology. But this expansion in education largely bypassed the desperate needs of the exceptional child in the special class. Much criticism of special education at that time was that it was simply a watered-down curriculum of general education with teachers using standard texts and aids for younger children, and adding basket making (Cawley, 1972; Lent, 1968; Martin, 1970).

In the late 1960's, James Gallagher, Commissioner of Special Education for the Handicapped in the U.S. Office of Education, expressed publicly the view that teachers had too much to do in diagnosing the handicapped, developing remediation curricula, and then having to evaluate it. He saw the need for a number of highly professional curriculum packages and argued successfully for their funding (Mayer, 1975).

A fundamental assumption was that curriculum packages would begin to solve the vast gaps in special education. Contracts were awarded by BEH and resulted in curriculum packages with titles such as "Me Now," "Project Math," "Read," "Prime," "More," "I Can," and Social Learning Curriculum. If these materials remain unused, it will be a betrayal of the original assumption and a waste of millions of tax dollars.

Ironically, a major cause for this lack of acceptance is to be found in the thoroughness with which the curriculum packages have been developed. Most funds for these curriculum projects were awarded to research and development centers attached to recognized universities and reputable commercial houses. In such settings, there is a respected tradition to

proceed with caution as new ideas and products are developed, tested, redeveloped, evaluated, and field tested. Several years went by before the first products began to appear on the market.

In the meantime, commercial publishers developed and published materials. Some were excellent, but many had undergone no field testing on the target population at which they were aimed. In 1969, at the convention of the Council for Exceptional Children, there were about two hundred exhibits on display. In 1976 there were 3,000. Even publishers are concerned about the ethics of marketing non-validated materials, and some states have introduced legislation to control abuses.

It is into this highly competitive milieu that the BEH-funded curriculum packages entered in an attempt to gain teacher acceptance and use. They were late to enter the market and so their commercial life began at a disadvantage simply because the intervening years were well spent in refining and testing their curriculum and their materials.

Some maintain that the field of special education now leads the other areas in the development of curriculum packages (Gallagher, 1967; Goldstein, 1974). These materials, prepared with federal and foundation grants, reflect the best in systematic development, attractive and well-functioning packages, flexible and integrated usability, and innovative content. Although widely disseminated, they have not been as widely adopted as they deserve.

A current major concern of curriculum developers is that not only are teachers in the field unaware of the extensive materials that are available, but also they are unable to recognize those that have been funded and tested under the stringent conditions laid down by BEH.

To date, there has been little attempt to help teachers select these materials. They are left to find out about new materials in a variety of ways which include handouts from publishers and literature from the Council for Exceptional Children. Curriculum developers all stressed that they were funded to develop materials only. Diffusion and adoption strategies were not in their funded projects.

To help solve this problem, BEH funded one program within the "Tips for Teachers" series to brief teachers about these materials and encourage their use. The present study was a consequence of that funding.

The Tips for Teachers series is intended for use in a wide variety of contexts. For example, teacher trainers can use them to supplement their instruction in methods courses. Or the instructional programs in the "Tips for Teachers" series can assume major instructional responsibility as trainees work through the programs at their own pace and accumulate credits by passing appropriate posttests. These programs can also be used in pre service and inservice teaching situations to focus the attention of teachers on new and alternative techniques in special education.

Task Analysis. Within this section of the needs analysis the information, knowledge, and skills are examined that the learner must acquire. These are deduced from the above-mentioned analyses where certain deficiencies are apparent. Three such deficiencies are as follows:

(1) Teachers are unable to discriminate materials which have been tested under the stringent conditions laid down by BEH from materials which have not been tested with care.

(2) Teachers are dazzled by the large number of commercially developed curriculum materials that are available, their high pressure advertising with colorful packaging, and skilled salesmen.

(3) To date, there has been little attempt to help teachers select and evaluate these materials. They find out about new materials by word of mouth, from other teachers, journals, advertisements, convention displays, publishers' handouts, literature from the Council for Exceptional Children, and occasionally from an inservice workshop. Thus, the selection of curriculum packages is all too often a hit or miss affair for teachers and administrators.

Specification of Instructional Requirements. The instructional requirements emerge from the needs analysis. For the present program they are as follows:

- (1) Identify, illustrate and demonstrate some of the better curriculum packages.
- (2) Specify their critical attributes.
- (3) Discuss and illustrate the advantages and disadvantages of using packaged curriculum materials.
- (4) List where to obtain reliable information on curriculum matters.
- (5) Explain and give addresses of Area Learning Resource Centers.
- (6) Present a checklist and show how to use it to select curriculum materials.

Specification of Instructional Objectives. The instructional objectives flow immediately from the task and concept analyses. For this program they are as follows:

- (1) State the critical attributes of a curriculum package.
- (2) List the advantages of using curriculum packages in the classroom.

- (3) List the disadvantages of using curriculum packages in the classroom.
- (4) Identify appropriate places to get information about curriculum packages.
- (5) State the principles of curriculum package selection for use in the classroom.
- (6) Use a checklist in making a selection of a curriculum package.

Construction of Criterion Test. Immediately following the specification of the instructional objectives, a criterion test was drafted to be used in both the formative evaluation and as part of the summative evaluation. This was tested for reliability using a prototype version of the program with four groups of master's degree special education teachers attending Indiana University for the summer sessions of 1975.

Organization Management and Program Design. In order to develop and produce the instructional program, a management team was established which included; the principal investigator to coordinate this program with the other programs in the "Tips for Teachers" series, an instructional developer, a special educational content expert and a television executive producer. While overall responsibility was delegated to the television executive producer, a harmonious working relationship was established from the outset. Within this context curriculum packages were collected and studied, and the needs analysis was designed and executed. The teachers in the target population analysis indicated a strong preference to learn by reading a printed article rather than by television, even though most of them had easy access to television equipment. A decision was thus made to incorporate the content of the program in a supplementary printed article.

The management team jointly examined all available data and formulated the content and design for the program. These formulations were then given to the television producer for scripting. Here a difficult situation arose. Whereas a script writer is accustomed to relying heavily on the creative process and the fruitful initiative of a fertile imagination, in the present case a multitude of instructional data in a predetermined form was presented to him for scripting.

This first draft script was then given to the remainder of the project team for their comments and, following a rewrite, the script was distributed for expert appraisal to an experienced teacher of exceptional children, a teacher trainer in special education, a curriculum developer, and an instructional television producer. This assessment of a script by program content and media experts is normal within the instructional development process. The assessment fed many fine-grain observations into the development process and led to many minor alterations as the script was rewritten for prototype production.

Storyboard and Prototype Production for Formative Evaluation. Television production is costly and a preproduction evaluation is highly desirable and cost effective. This can be done with a storyboard. The assumption behind storyboard evaluation is that a person can make a television story out of a series of still pictures or drawings by imagining whatever motion is necessary. In commercial television advertising, it has been found that audiences identify with a storyboard extremely well. One study compared scores of a group viewing a storyboard and then the final film version (edited in Sedlik, 1971). The correlation ranged from .86 to .93 on six selected measures. With sophisticated audiences, a considerable degree of insight can be obtained at the formative evaluation

level with this technique. The most basic storyboard takes the significant scenes from the script and places them beside the written narration. The script is then read like a comic strip. A greater degree of simulation can be gained by producing the audio track and handing the pictures to the audience. A further stage would be to videotape the stills and lay down the audio track so that the audience could view the total program as a simple line drawing film. In one study (Hovland, Lumsdaine, & Sheffield, 1949), 60% of an audience believed it had just seen a motion picture film when what had been shown was a superior sound slide show. Research with 16 mm film (Twyford, 1951) has shown that the visuals typically add only 20% to the learning from the audio track alone.

Even with a simple storyboard, a substantial investment is required. In the present project, because of personnel and fiscal restraints the script and visuals were not produced onto the video monitor. Five subjects concurrently read the script and viewed line drawing sketches of the proposed television visual sequences and were afterwards questioned. As a result, several additional illustrations of curriculum packages and a graphic summary of each section were added. The general reaction to the presentation was favorable. It should be noted, however, that the verbal explanation that accompanied the script and sketches did detract from a direct visual grasping of the messages.

Television requires considerable coordination of personnel and electronic equipment. This program was videotaped on color videocassette, but due to organizational complexities editing had to be completed in monochrome. Thus, the final version was in black and white with presumably a consequential decrease in impact. This prototype version was used in a further stage of formative evaluation.

The developmental testing of the prototype program was undertaken with 20 special education teachers at Indiana University working on a master's degree. After they had viewed the program, they were given an open-ended questionnaire, and during the viewing of the program they were asked to respond to a program analyzer.

The program analyzer is an instrument that obtains feedback and viewer appraisal "in real time," that is, while the program is being viewed. A light is placed on top of the television monitor. Each viewer is given a sheet of paper with consecutive squares (Appendix A) and asked to vote yes or no with a check (✓) or a cross (x). At predetermined intervals the light is switched on for five seconds, and the viewer is asked to answer a question. For this program the following questions were used: Do you find this enjoyable?; Is this new information?; Is this of professional interest to you? This information is then plotted as graphs whose time line is coded as to what part of the program is in progress. Dips and peaks give indications of the program's strengths and weaknesses which then require revision or additional support material.

From an analysis of the questionnaires and the program analyzer the following feedback was obtained as a basis for revision:

1. The introductory history was visually interesting, but not directly pertinent to the objectives of the program and needed to be shortened.
2. Portions of the script needed revision in expression.
3. Each section required a summary at the end of the information being presented.
4. The checklist to aid teachers select curriculum materials was confusing and needed to be redesigned.

5. The program was reduced in duration from 32 minutes to 25 minutes.

6. For 75% of the sample it was "new information." 78% found it "enjoyable" and 81% thought it was of "professional interest."

Final Production. When the recommendations of the 20 special education teachers were analyzed and incorporated into the script and additional graphic work was completed, the program was re-edited to the final scripted form.*

*This final television script of "Choose a Curriculum Package" and the accompanying printed article are included in the book to accompany this "Tips for Teachers" module. This is published and available from the Center for Innovation in Teaching the Handicapped, Indiana University, Bloomington, Indiana, 47401, USA.

CHAPTER V

METHOD

Subjects. Eighty people working in special education participated. Four locations were selected in a manner designed to approximate a representative sample of the special education teacher population. All who were working in special education at each location participated in the study as one of their regular inservice training workshops. Three were urban schools and the fourth was a rural county school district. The locations and numbers of subjects at each are given in Table 1.

Table 1
Geographical Areas and Sample Population Numbers

SITE NUMBER	LOCATION	STATE	n
1	School of Contemporary Education, Alexandria.	Virginia	20
2	Kennedy Institute, Baltimore	Maryland	12
3	Rose School for the Handi- capped; Washington	D.C.	16
4	McDowell County	North Carolina	32

Information was obtained about each of the subjects' age, sex, professional status, teaching experience, preference of means to learn about curriculum packages, and their actual use of such packages. The information was collected in such a way that the subjects remained anonymous. A summary of this information is presented below.

Major demographic characteristics of subjects:

Sex:

Female = 71.25%

Male = 28.75%

Age:

Below 19 1.25%

20 - 29 56.25%

30 - 39 17.50%

40 - 49% 17.50%

50 and over 7.50%

Professional Status:

Special education teachers 65.00%

Special education trainees 18.75%

Special education aides 8.75%

Special education consultants 7.50%

Teaching Experience:

Mean number of years teaching in general education 6.25

Mean number of years teaching in special education 4.25

Preference of means to learn of subject matter of curriculum packages:

Read an article	33.75%
Listen to a lecture	26.50%
View a TV program	38.75%

Actual use of curriculum packages during current year:

Had not used them	45.00%
Had used them	55.00

The total number of packages used by the 55% was 139.

Frequency distribution of curriculum package use by subjects:

Number of packages used	Number of subjects
0	36
1	12
2	14
3	4
4	5
5	4
6	1
9	1
10	2
12	1

Recall of Information: Five questions all relating to the objectives of the module were used to measure the recall of information. These questions were open ended: The first sought information about the critical attributes of curriculum packages, the second asked the advantages and disadvantages to using them, and the third asked where to seek

details of information about curriculum packages. The fourth question required the learner to name four curriculum packages suitable for specific subjects. The fifth asked whether they knew where to get information from their appropriate Area Learning Resource Center.

Scoring: The number of correct responses to these five questions were summed. The first question had seven parts for a correct answer and the second question had thirteen parts for a correct answer. However, these first and second questions contained some overlap, for four of the advantages of using curriculum packages were indeed the very critical attributes of packages in general. Thus, where a respondent answered these four items correctly in at least one of the questions, a correct score of 16 was recorded, and where a respondent gave the same answer in both questions a score of 16 was recorded. The third question contained seven categories, even though eleven items could be named. Thus, a score giving items from each of the categories was treated as a complete answer. The remaining two questions had a combined score of five for a complete answer. Thus, 28 was the highest possible score. Three people scored the answers independently and then met together to discuss the differences and determine the score.

Procedure: To participate in this study, subjects were gathered in their normal group setting for inservice training. The procedure was designed in four time intervals so that all would view the video component simultaneously. It also allowed three quarters of the sample to receive both video and print components during the study. The time intervals for the reading of the print component and writing the posttest were determined by tests prior to the study. The times taken ranged from six to eleven

minutes, with the mean at eight minutes twenty-three seconds.

Intervals for the first, second and fourth were then set at 10 minutes.

During the procedure a question was used that had no relation to curriculum packages. This was: "Please list the reasons for your interest in special education." This was used simply to fill in one time period and was not analyzed as part of the experiment. Further, one group was given a booklet to read from the "Tips for Teachers" series that had no relationship to the module being tested. As noted above this was so all could view the video component at the same time.

The procedure to carry out the experimental design is set out in Tables 2 and 3.

A large manila package was distributed according to a prior selection from a table of random numbers. On the front of the package were typed instructions (Appendix B). Within each package were three envelopes. Subjects read that their envelopes may contain questions and reading materials that were different from those of their neighbors. Thus, no one knew the contents of the other subjects package.

Subjects were randomly assigned in equal numbers at each of the four geographical locations separately. The numbers in each group at each location are shown in Table 4.

Table 2
 Procedure to Carry Out Experimental Design

GROUP	FIRST TIME INTERVAL	SECOND TIME INTERVAL	THIRD TIME INTERVAL	FOURTH TIME INTERVAL
A	WRITE TEST ON SUBJECT OF CURRICULUM PACKAGES	READ CURRICULUM PACKAGE BOOKLET	VIEW CURRICULUM PACKAGE TELE- VISION PROGRAM	WRITE REASONS FOR INTEREST IN SPECIAL EDUCA- TION
B	WRITE REASONS FOR INTEREST IN SPECIAL EDUCATION	READ CURRICULUM PACKAGE BOOKLET	VIEW CURRICULUM PACKAGE TELE- VISION PROGRAM	WRITE ON SUB- JECT OF CURRIC- ULUM PACKAGES
C	WRITE REASONS FOR INTEREST IN SPECIAL EDUCATION	READ NON CUR- RICULUM PACKAGE BOOKLET	VIEW CURRICULUM PACKAGE TELE- VISION PROGRAM	WRITE TEST ON SUBJECT OF CUR- RICULUM PACKAGES
D	READ CURRICULUM PACKAGE BOOKLET	WRITE TEST ON SUBJECT OF CUR- RICULUM PACKAGES	VIEW CURRICULUM PACKAGE TELE- VISION PROGRAM	WRITE REASONS FOR INTEREST IN SPECIAL EDUCATION

Table 3
Experimental Design to Test Instructional
Module and Compare Individual Components

Group A	(N = 20)	R			O_1
Group B	(N = 20)	R	X_1	X_2	O_1
Group C	(N = 20)	R	X_1		O_1
Group D	(N = 20)	R		X_2	O_1

where R = random assignment of subjects

X_1 = treatment using video component

X_2 = treatment using print component

O_1 = test on subject of curriculum packages

Table 4
Location and Numbers in Each Treatment Group

	Location 1	Location 2	Location 3	Location 4
Group A	5	3	4	8
Group B	5	3	4	8
Group C	5	3	4	8
Group D	5	3	4	8

Location 1 = School of Contemporary Education, Virginia

Location 2 = Kennedy Institute, Maryland

Location 3 = Rose School, Washington, D.C.

Location 4 = McDowell County, North Carolina

CHAPTER VI

RESULTS OF EVALUATION OF RESEARCH QUESTIONS

One of the research questions of this study was: Does an instructional module produced according to the 4-D model, with a video and a print component to train special education teachers about curriculum packages, achieve a 90/90 result?

The raw scores gained by the experimental group that received both the video and the print component and the raw scores of subjects in the other groups and at each location are given in Appendix C. The raw scores of subjects in each treatment group in rank order are given in Appendix D. The level of mastery achieved by this group is given in Table 5.

Table 5

Level of Mastery Attained by Group B

GROUP B		SCORE
100%	achieved	53.60%
90%	"	75.00%
75%	"	85.00%
60%	"	90.00%
35%	"	100.00%

Thus a 90/90 level of mastery was not achieved, rather it was 90/75 and 60/90, that is 90% of the target audience scored 75% or better, and 60% of the target audience scored 90% or better on the criterion test.

A series of questions sought to compare the effects obtained from using the television component, from using the print component, from using both components, and from using neither component at all. The level of mastery that each group attained is given in Table 6.

These results show that no group achieved a 90/90 level of mastery. Within Group B that received both the video and the print components, 90% of the sample achieved a 75% score, and 60% of the sample achieved a 90% score. 100% of the sample gained a 50% score. Within Group C that received the video presentation only, 90% achieved a 71% score. The other scores were identical to those of Group B.

Table 6

Level of Mastery Attained by Each Group

	% of score that 90% of group achieved	% of group that achieved 90% of score	% of group that achieved 50% of score
Group A (control)	25	0	20
Group B (program & booklet)	75	60	100
Group C (program)	71.43	60	100
Group D (booklet)	33.14	10	65

A one-way analysis of variance on the criterion test was performed to determine significant differences between mean test scores under the various treatments. The findings are given in Table 7.

Table 7

Summary of One-way Analysis of Variance on Criterion Test

Source	df	Mean Square	F	p
Total	79	66.82		
Groups	3	1199.65	54.27	.01
Error	76	22.10		

These results show that there was a significant difference between treatments at the .01 level. A Newman-Keuls (Winer, 1962) test showed (Table 8) groups B & C did not differ significantly from each other, but that each of them differed significantly from the other two groups.

Table 8
Test on All Ordered Pairs of Means

(i)

Order	1	2	3	4
Treatments in order of T_j	A	D	C	B
T_j	180	288	484	498

(ii)

	A	D	C	B
A	-	108	304	318
D		-	196	210
C			-	14
B				-

(iii)

Truncated range r	2	3	4
$q_{.99}(r, 76)$ (at .01)	3.751	4.18	4.58
$q_{.99}(r, 76) \sqrt{nMS_{error}}$	78.8438	87.8846	96.2945

(iv)

	A	D	C	B
A	-	**	**	**
D		-	**	**
C			-	
B				-

Discussion of Results

The 90/90 criterion level of achievement that was involved in the research question was not attained. Whether the 90/75 result that was achieved does represent success or failure for the model depends on other factors. If the 90/75 level of mastery gives teachers adequate information to select curriculum packages and to use them with their exceptional children, then this level could be said to represent success.

Further, the level of 90/75 should be viewed in light of resources available for development and production. It was noted earlier (Ofiesh, 1963) that the cost to develop materials from a 90/70 level to a 90/90 can be as much as six times as great as the development costs to improve materials from 90/50 to 90/70. Such resources may be readily available in the armed forces, but in recent years they have been rarely available in education.

The low level of mastery by the control group (Group A) reflects the findings of the needs assessment of this study. The concern that emerged from the questionnaire with curriculum developers was that teachers did not possess information or skills to select curriculum packages. In the control group, no subject had a 90% score, and 90% of the group had less than 25%. This level of mastery represents a minimal knowledge about curriculum packages, a level that suggests at least part of the reason that they are neglected by most teachers.

The mean score of the experimental group (Group B) which received both the video and the print components of the module was not only significantly greater than that of the control group (Group A), but numerically much greater. As noted above, the definition of satisfactory level of mastery depends on many factors, one of which is the level of mastery in comparison to that of the control group. In this case the gain from

control condition to experimental condition is from 90/0 to 90/75 and from 0/90 to 60/90. This represents a high degree of improvement, and, given the limited resources available, these results do give substance to the decision that might be made to cease development and not proceed to the 90/90 ideal level.

The discussion above that relates to the control group and the experimental Group B can also apply to Group C which received the video treatment only. It will be recalled that these two groups' performances were not significantly different--namely, 90/75 and 90/71.45 showed no significant difference at the .01 level. Thus, the print component added little extra to the results on the recall of information posttest. However, part of the rationale for the print component was to provide the teacher with a reference for later use. This study did not test to see if it would in fact be used for that purpose. However, the above finding raises the legitimate question whether a booklet is needed or whether a four-page leaflet which contains the essential information would be adequate.

The level of mastery gained by Group D which received the print component only was 90/33.14. This was significantly different from the results of groups B and C. The difference may be explained by the duration that the subjects had to read the print component as compared to the duration that subjects had to view the video component. The teachers in the sample group who read the article to determine the duration to be used in the experiment were briefed to read it as if it were a normal article in a professional journal. Their speed of reading thus represented the time that they would spend for reading such subject matter. While the

reason for the significant difference between the groups may have been due to the additional visual information of the video presentation, it may have been simply due to the extra time that the teachers were forced to spend viewing the video. Whether they would have achieved the level of mastery of groups B and C by reading the article for 25 minutes is irrelevant, for they would not normally spend that time on an article without additional motivation. On the other hand, they readily accepted the visual presentation of longer duration. It may be further argued that a print component that is instructionally designed with information mapped out in a visual chart would be more effective. However, the point of comparison was between video and the print form that teachers were accustomed to read when gathering professional information, i.e., a printed journal article.

It should be stressed that the use of a criterion test to validate this instructional module does highlight the importance of conducting the initial needs assessment and target population analysis with great accuracy. The objectives and instructional specifications flow directly from these analyses and, in turn, are the basis for the criterion tests. If the initial analyses are not accurate, then the criterion tests cannot reflect a valid result.

Finally, from this study it is not possible to draw any conclusions about the comparison between the instructional development procedure and the creative process. What can be said is that the instructional development method based on a systems approach did, in this case, lead to a measure of success. Whether the same or better results would be gained by a production based purely on a creative process is unknown from this study. What is known is that this program developed on a systems approach achieved a 90/75 and 60/90 level of mastery.

CHAPTER VII

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Many institutions have invested capital and many individuals have expended creative energies in the use of television for instruction. With some exceptions the results have not merited the money and energy spent. Some efforts have been made to develop instructional programs based upon an instructional development model that uses empirical data regarding learners' inservice and postservice reactions to programs. The present study is a continuation of this systematic-empirical approach to the production of an instructional television program. The program was designed to instruct special education teachers in the selection of curriculum packages. The program was tested to see whether a "90/90" result was attained, i.e., whether 90% of the learners attained 90% of the highest possible score. Further, the effectiveness of the program was compared with that of a printed article that contained comparable information.

Eighty people working in special education participated. Four geographical locations were selected in a manner designed to approximate a representative sample of the special education teacher population. Subjects were randomly assigned in equal numbers to four treatment groups. Five questions based upon the objectives of the program were used to measure the recall of information.

The results were that (a) 90% of the participants who viewed the television program learned 72% of the content, and 60% learned 90% of the content, which is to say that the "90/90" goal

was not attained, (b) participants who viewed the television program learned significantly more than those who did not, and (c) participants who not only viewed the television program but also read the printed article did not learn significantly more than the participants who only viewed the television program.

Conclusions

It is concluded that the 4-D instructional development model can be used by a television producer, and that in this case it was used to design and produce an instructional television program that was effective at the "90/72" and the "60/90" level. Comparable instructional television programs that the writer produced according to the traditional procedures were never tested. But on the basis of the above data, as well as on the basis of the writer's informal comparison of those programs with the program in this present study, he is led to conclude that the systematic-empirical approach is very much the superior one.

In the present study the use of an instructional television program to present information to teachers about curriculum packages was more effective than the use of a printed article. This result may have been due to the fact that teachers spent more time viewing the television program than reading the article, and because the program was presented with musical background and visual examples of curriculum packages. All of this meant that the television presentation was more costly. The actual cost is difficult to calculate because it was produced within a project which absorbed many of the overhead costs and where equipment was already available without cost. The comparative cost of the television program

and the printed article is also difficult to determine because both relied heavily on the information gained through the initial stages of the instructional development process. However, an estimate by the writer, based on the production and on his prior experience, would be that the television program took twenty times as long to script, film and edit as the printed article took to write.

From this study it is concluded that a certain level of effectiveness was attained by the instructional television program. That conclusion was based on a test of recall of information concerning the selection of curriculum packages. The implicit and underlying intent was that teachers would exhibit more effective selection and use of curriculum packages. Such actual selection and use were not observed in the present study.

Recommendations

It is recommended that a series of instructional television programs be produced using the systematic-empirical approach, and that a series be produced on the same subject using traditional television production procedures. A test of the differential effects of these two approaches would provide more explicit information as to the comparative effectiveness of the systematic-empirical and the traditional approaches.

A longitudinal study of the teachers who participated in the present study would show whether they considered the possibility of using curriculum packages and whether they applied them in their work with exceptional children.

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APPENDIX A

Score Sheet for Use in Program Analyzer

Group: _____

Mark a response each time the light is switched on above the television monitor. Check boxes from left to right. A bell sound will indicate the beginning of a new line. Your check should indicate your response to the actual five seconds that the light is switched on. Mark accordingly: Positive = +; Negative = -; Uncertain = 0.

Is this new information?

APPENDIX B

Instructions to Subjects Participating in This Study

1. Please read these instructions now.
2. Do not open this package until you are given the signal.
3. Your colleague has an identical package, but the contents may be different.
4. Enclosed in the package are three envelopes marked A, B, and C.
5. On the given signal, open the package, take out envelope A, read the instructions, and open it. You will have 10 minutes to work through its contents.
6. On the signal after 10 minutes return the forms to the package, take envelop B, read the instructions, open it and begin to work through its contents.
7. On the signal after 10 minutes return the forms to the package. A TV program will then be presented.
8. At the end of the TV program take envelope C, read the instructions, open it and begin to work through its contents.
9. On the signal after 10 minutes return the forms to the package.
10. Please leave the package on the chair. Thank you for your help.

APPENDIX C

Raw Scores of Subjects in Each Treatment Group and at Each Location

	Virginia	Maryland	D. Columbia	N. Carolina	
Group A	7	13	7	4	5
	14	15	11	7	3
	7	13	16	3	5
	15		10	5	7
	13				
Group B	28	21	28	28	28
	25	22	21	24	28
	26	15	25	27	20
	24		28	24	28
	28				
Group C	25	28	28	28	21
	24	25	28	20	14
	20	21	28	14	22
	27		28	28	28
	27				
Group D	22	11	7	6	20
	16	7	23	14	14
	14	14	9	16	9
	19		10	18	28
	11				

APPENDIX D

Raw Scores of Subjects in Each Treatment Group in Rank Order

Group A	Group B	Group C	Group D
16	28	28	28
15	28	28	23
15	28	28	22
14	28	28	20
13	28	28	19
13	28	28	18
13	28	28	16
11	28	28	16
10	27	27	14
7	26	27	14
7	25	25	14
7	25	25	14
7	24	24	11
7	24	22	11
5	24	21	10
5	22	21	9
5	21	20	9
4	21	20	7
3	20	14	7
3	15	14	6

VITA

Michael Stanislaus Parer was born on April 4, 1933, in Melbourne, Australia, where he completed his elementary and secondary education. He entered Corpus Christi College and studied Philosophy and Theology. In 1959 he was ordained a Catholic priest.

For seven years he worked in the parochial ministry and took an active role in adult education and educational film production for the Melbourne archdiocese. In 1967 he joined the Australian Broadcasting Commission as a radio and television producer and Broadcast officer. In 1971 he was asked by the Australian Federal Government's Department of Immigration to initiate a Migrant Education television project to explore the potential of television to teach english as a second language and assist the integration of new settlers into the Australian way of life as well as to give Australians an appreciation of their traditions. Eighty weekly programs of one hour duration were produced and telecast in this series which still continues throughout Australia. He has five books published and in 1973 was named a Commonwealth Literary Fellow.

In 1974 he came to Indiana University and was admitted to the doctoral program. He accepted a position at the Center for Innovation in Teaching the Handicapped where he had responsibility as television co-ordinator and producer.